



September 30, 2009

BY ELECTRONIC FILING

Ms. Marlene H. Dortch
Secretary,
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

RE: GN Dkt. No. 09-157: Fostering Innovation and Investment in the Wireless
Communications Market

GN Dkt. No. 09-51: A National Broadband Plan for Our Future

Dear Ms. Dortch:

Enclosed for filing in the above-referenced dockets is my White Paper,
"Innovation and the U.S. Wireless Industry."

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Mark Lowenstein", with a stylized flourish at the end.

Mark Lowenstein
Managing Director
Mobile Ecosystem

Enclosure



Innovation and the U.S. Wireless Industry

Mark Lowenstein
Managing Director
Mobile Ecosystem

September, 2009

Introduction and Summary

Wireless has been among the fastest-growing industries on the planet, and is entering a new stage of innovation and vibrancy. In just over 25 years since the first cellular systems were deployed, we have gone from near zero penetration to nearly 90% in the United States. Worldwide, approximately half the world's population has a mobile phone – indeed wireless has brought many developing countries into the modern communication era more quickly and less expensively than might have been had we been reliant primarily on fixed line technology.

Wireless is an industry that, in the United States, generates \$150 billion in service revenues, employs some half a million people, and contributes more than \$20 billion in infrastructure investments every year.¹

Consumers have also seen rapid advancement in the technology and affordability of wireless communications. The first cellular services were for cars, phones cost more than \$2,000, and service pricing was well over \$1.00 per minute. Advancements in microprocessor technology, combined with a market-led, investment-centric industry structure, have led us through rapid improvements of the mobile value proposition. Today, the typical cell phone weighs less than four ounces and can be bought for under \$100 (non-subsidized price). Voice service pricing, at an average retail rate of \$0.05 per minute, is among the lowest in the industrialized world, and less than half the average retail price in the U.K., for example.² Average usage has ballooned from under 100 minutes per month per subscriber in the early 1990s to over 800 MOUs per month today – again, among the highest in the world. The average in Europe is 161 per month and in Japan it is 138 minutes.³

The past ten years has seen rapid acceleration in additional capability of wireless devices and services. There are more cameras on phones today than total cameras ever manufactured.⁴ In addition to cameras, “standard equipment” on many phones today includes a Web browser, music player, GPS, and more external memory (for storing digital media) than many PCs shipped with just a few years back. More advanced devices (a.k.a. “smartphones”), have become mini-PCs, sporting over 256 MB Flash//128MB RAM, up to 16 GB of internal or external storage, full HTML browsers, QWERTY keyboards, touch screens, the ability to play multimedia files, and other high-end gewgaws, such as video cameras, “accelerometers”, a compass, and so on.

¹ CTIA, Semi-Annual Industry Survey. The employment figure is inferred from the service provider figure of 268,000 employees.

² “Mostly Mobile,” UK Office of Communications, available at <http://www.ofcom.org.uk/consult/condocs/msa/msa.pdf> (July 9, 2009) (“Mostly Mobile”).

³ FCC 13th Annual Wireless Competition Report, p.10

⁴ Dan Hesse, CEO, Sprint-Nextel, commenting on the Charlie Rose program, September 8, 2009.

Wireless networks have evolved to harness these new capabilities. We are seeing successive “generations” of network capability launched every five or so years now, in an accelerating process. The 1985-95 period was based on analog networks. Digital PCS was launched in the mid-1990s. The first 3G networks were launched in the early part of this decade, and there have since been several substantial “upgrades” to these 3G networks. The first 4G services are being launched this year. Five years ago, the average mobile subscriber was experiencing about 56 Kbps of throughput. Today it is often close to 1 MB – about the equivalent experience of an entry-level DSL network in the home.

The combination of capable devices and fast networks is leading to a rapid transformation of how consumers are using wireless services today. As an example, typical iPhone data usage is more than ten times that of an average feature phone. Shipments of PC cards for laptops have been doubling every year, with typical subscribers using about half a gigabyte of data a month. And already, major operators – led by Verizon Wireless and Sprint-Nextel in the U.S. – have committed billions of dollars to investing in 4G networks, which will support speeds comparable to today’s home broadband networks. With some 90% of the population already owning a cell phone, the 4G investment is predicated on the emergence of a host of new devices embedded with wireless technology – some used by consumers, such as netbooks, tablet computers and portable gaming devices, and then myriad devices used for specific functions, from machine-to-machine (M2M) communication, health care, and utilities.

As an analyst who has been part of this industry almost since its inception, I have been privileged to witness the near logarithmic growth of wireless, the rapid advances in technology, and continued evolution of the user experience.

When I consider the FCC’s efforts to foster innovation and investment in the wireless communications market, six key questions come to mind:

- 1) Is innovation occurring at a rapid pace, leading to continued improvements in the capabilities and experience being offered to users?
- 2) Do we have the proper market and regulatory structure in place to foster innovation?
- 3) Are investments continuing to be made *into* the industry, and *by* the industry?
- 4) Are wireless services, devices, and features reasonably accessible and affordable to consumers?
- 5) Is there reasonable choice and robust competition in the wireless market?
- 6) Do we have the right market and capital structure to ensure continued investment in the industry?

All these questions can be answered “yes.” Below, I will explore these questions by examining the state of innovation in the U.S. wireless industry and its effect on products

and services offered to the consumer. Then I will discuss whether our market is structured to support continued innovation, and how we are faring with respect to other advanced economies.

I. State of Innovation in Wireless

Innovation in wireless happens across several categories that contribute to what products and services are offered to the subscriber.

A. Technology Innovation

Wireless has been one of the key components of the burgeoning high tech industry in the United States over the past twenty-five years. Probably the single greatest contributor to the evolution of wireless devices and networks has been rapid advancement in microprocessor technology. Moore's Law, which says that the number of transistors that can be placed on a circuit doubles approximately every two years, has defined many aspects of technology improvement in wireless, from device size to network capacity to our ability to fit a five mega pixel camera on a cell phone. The same advancements in microprocessors that have contributed to the evolution of personal computers, broadband networks, and so many other aspects of consumer electronics are responsible for many of the advancements in wireless. The most visible aspects of this, of course, are the rapid reduction of cell phone form factor and increase in functionality and the evolution of wireless networks.

Exhibit 1: Evolution of Device Capabilities and Functionality

Category	Type of Improvement
Form Factor	- From car phones to personal portable phones. Average device today weighs 4 oz. - Addition of QWERTY keyboard, touch screens, etc
Price	- Initial phones cost \$2,000+. Today, good phones can be bought for under \$100
Processor	- The more advanced phones today have 1 GHz processors – essentially that of a mini PC. - Intel's Atom, the latest processor for mobile devices fits 47 million transistors on a single chip measuring 26 mm sq. ⁵
Memory	- Some devices today can carry up to 16 GB of on-board memory and even more externally
Functionality	- Standard Equipment on today's average feature phone comes with a 2 mega pixel camera, GPS, Web browser

It should be noted that the innovation in microprocessor technology has been largely driven by U.S. high-technology heavyweights such as Intel, Qualcomm, and Texas Instruments.

It should also be noted that many critical advancements in industrial design for mobile phones have been pioneered in the United States. Motorola invented the "flip" phone

⁵ Source: Intel

(StarTac) in the mid-1990s, and then earlier this decade pioneered the ultra-thin form factor, with the RAZR. Of course, the story of the past two years has been the iPhone, which represents numerous advancements in industrial design.

In addition to device hardware, we are seeing rapid advancements in software for the device. In fact, software is the locus point of innovation on mobile phones today (since they can't get much smaller and lighter than they are). We see this software all over the user experience on mobile devices, from full HTML browsers on phones such as the iPhone and Palm Pre, to advancements in applications (e-mail, multimedia), and innovation in the user interface (QWERTY keyboards, touch screens). Again, this is an area led by U.S. high technology companies: Apple, Palm, RIM (based in Canada), and Microsoft, to name a few. OpenWave, which is based in California, pioneered the phone browser in 1995, and their WAP browser is on some 50% of all phones being used in the world today.

Networks

Advancements in wireless networks have been rapid and are actually accelerating in pace. Innovation is occurring across a number of categories, itemized in the table below:

Exhibit 2: Evolution of Device Capabilities and Functionality

Category	Type of Improvement
Network Capacity	- Network is able to carry a much higher number of voice conversations and data traffic, per MHz of spectrum, with each successive "generation"
Data Speeds	- Significant improvements in throughput rates and lowering latency. - 3G networks are up to 21 Mbps (HSPA+) downlink speed, compared to 19.2 Kbps in 1G systems and 56 Kbps in 2G systems. 4G networks have capabilities exceeding some home broadband networks
IP	- Networks steadily moving toward all IP architecture
Economics	- Continued significant improvement in "economics" – the amount it costs to carry a voice call or deliver a kilobyte of data
Alternative Technologies	- Many networks built now use tower sharing - Distributed antenna systems being used for some of new network builds and capacity adds - Some of the first solar-powered cell sites are being deployed in select geographies

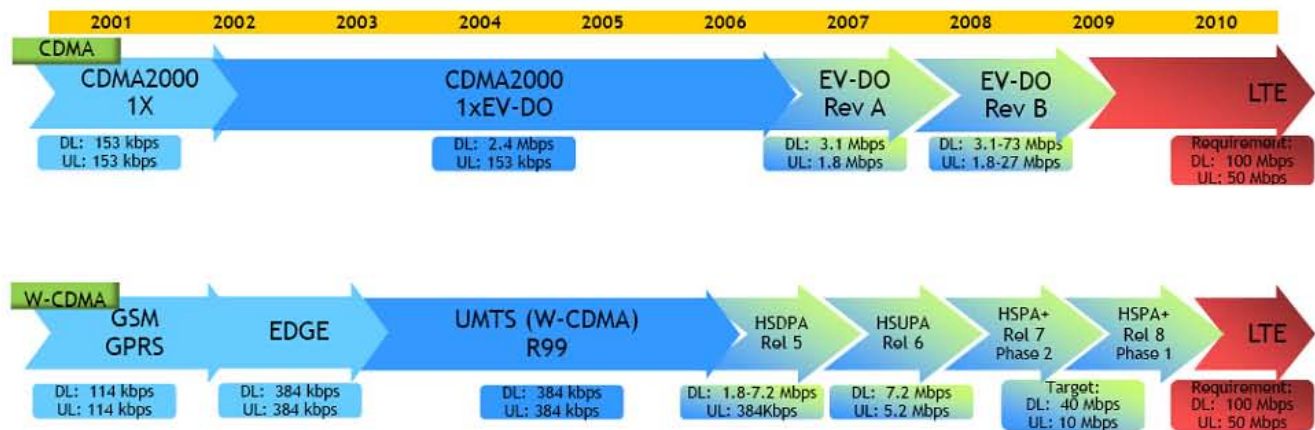
In addition to the tremendous advances in wireless networks, it is important to note the extent of network-related innovation that is originating here in the United States. Qualcomm, based in San Diego, invented the CDMA air interface, which at the time was based on pioneering "spread spectrum" technology. CDMA is used by Verizon Wireless, Sprint, and operators representing some 20% of the world's subscribers.⁶ Many of the fundamental patents of CDMA technology are part of the foundation for 3G versions of the GSM network (called WCDMA), as well as the "4G" systems called LTE that is rapidly becoming the air interface that most operators plan to deploy.

⁶ CDMA Development Group. www.cdg.org.

iDEN, the air interface for the leading push-to-talk systems such as that pioneered by Nextel, was also invented in the U.S. by Motorola. iDEN systems are heavily used by U.S. government agencies and other key vertical industries, given the superior performance of the “direct connect” service. WiMax, another standard for wireless data and some of the first 4G systems, has been promulgated by Intel and many companies that have not been traditional “players” in wireless. It is being deployed for mobile broadband networks all over the world. Clearwire, a joint venture of Sprint, four cable companies, Intel, Cisco, and Google, is building the world’s largest mobile WiMax network here, with five major cities already launched.

Exhibit 3: Network Evolution Path

Source: 3G Americas



The pace of innovation in wireless networks has accelerated. As the diagram above shows, continued network upgrades are leading to significant improvements in throughput rates for wireless data, in a compressed cycle.

Since the early 1990s, Europe has harmonized around one air interface standard for cellular, called GSM, as decided by the European Telecommunication Standards Group (ETSI). In the United States, the FCC allowed market forces to determine air interfaces – which has led to tremendous innovation: CDMA, iDEN, WiMax, among others. Although this multi-standard situation has resulted in some complexity, it has spawned tremendous innovation. Some of the core technologies pioneered by Qualcomm in CDMA are now the basis for all 3G networks (whether 3GPP or 3GPP2) as well as LTE and WiMax for 4G. Multi-standards have also pushed engineers and chip designers to develop “multi-mode” terminals that accommodate both CDMA and GSM air interfaces, as we can see in some global phones and PC cards today. U.S. companies have also been at the forefront of antenna and repeater technology development, from linear power amplifiers (Powerwave) to distributed antenna systems (NextG), MIMO, and software defined radio (Vanu).

Another way to examine innovation and the pace of innovation is to look at the number of patents issued related to wireless technology. Wireless has been an especially vibrant area for patent activity. According to U.S. Patent Office records, 27,464 patents related to wireless were issued between 2004 and 2008, 13,866 in the prior five years, and 4,840 in the five years before that. In other words, the number of wireless-related patents has been doubling or more every five years, indicating a robust, technology-based and intensely innovative industry.

B. Innovation in Products and Services

It is fine to look at technology developments from an empirical standpoint, but how does this translate into benefits for consumers? The pace of improvements in the “wireless experience” over the past 25 years has been nothing short of breathtaking.

Initial wireless service coverage was spotty, voice quality was static-y, and there were frequent dropped calls and large swaths of territory where service was simply not available. Fast forward to today – consumers have a choice of four “nationwide” networks, and a choice of several other service providers who are either regional providers or provide near-national service through roaming agreements. Additionally, there are several “mobile virtual network operators” (Virgin Mobile, Boost, TracFone, etc) offering a fully-featured, branded wireless service via resale agreements with national facilities-based providers. The average consumer in the U.S. today can choose from at least eight providers, if MVNOs are included. The growth of MVNOs is a reflection of a market structure open to innovation. As wireless network capacity has expanded, facilities-based wireless providers have proven increasingly willing to host MVNOs and accept the “resale” model.

How does the U.S. market compare in level of competition to other geographies? The U.K. market is recognized to be the most competitive in Europe, with five principal facilities-based competitors. The top four competitors in the U.K. serve 93.5% of the market, whereas in the U.S. they serve 85% of the market. And two operators, O2 and T-Mobile, have announced plans to merge – creating one company with 35% share of the market. So the U.S. market can unquestionably be considered more competitive than the most competitive country in Europe.⁷

Since the launch of cellular services, consumers have seen significant improvements in wireless network coverage, quality, and reliability, as indicated by recent surveys that document decreasing concerns about failed call attempts and dropped calls.⁸

The innovation we have seen in devices and networks is reflected in the value that subscribers receive from their service today. The average retail price per minute at the

⁷ “Mostly Mobile,” UK Office of Communications, available at <http://www.ofcom.org.uk/consult/condocs/msa/msa.pdf> (July 9, 2009) (“Mostly Mobile”).

⁸ Consumer Reports, “Best cell-phone service,” pp. 28-29 (January 2009).

launch of cellular was over \$2.00. By earlier this decade, it was closer to \$0.20, and has since dropped to about \$0.05. In fact, wireless pricing is now competitive with wireline pricing, which is reflected in the significant landline substitution we are seeing today. According to FCC analysis, the Consumer Price Index increased 29% from 1997 to 2007, while during that time period cellular services declined by 36%. By contrast, local telephone prices increased 36%.⁹ The fact that a wireless operator can run a successful business at an \$0.05 per minute retail price point is testament to the significant innovation we have seen in wireless handsets, networks, and economics.

There is also tremendous innovation with respect to the products and services available to subscribers. The big story in wireless over the past five years has been the tremendous growth in data services, from near zero in 2000 to more than 30% of revenues at some operators.

Data revenues today come from a far broader portfolio of services, such as:

- **Text Messaging.** Text messaging became much more prevalent when carrier interoperability was introduced in 2001. Today, text messaging volumes exceed more than 50 billion per month, and represent an incremental revenue stream of some \$20 billion annually.¹⁰
- **Mobile e-mail** has been another fast-growing market, led by smartphones such as the Blackberry. There are nearly 30 million Blackberry subscribers, with the United States being the largest market by a significant factor.
- **Personalization applications** such as ring tones, wallpaper, and so on.
- **Multimedia.** Some 40% of phones in the U.S. are now shipping with multimedia players, which allow subscribers to use their phones for playing music, viewing video content, and, on some devices, watching television.
- **Web browsing.** The past three years have seen significant improvement in the ability for mobile phones to access Web-based content. Innovation around transcoding (adapting Web content for a mobile device), and the development of full HTML browsers for smartphones has been a catalyst. In fact, the wireless industry has rallied around HTML 5 as an open standard for building Web applications for a mobile device (such as on the Palm Pre). A recent Yankee Group report indicated that 31% of mobile users are accessing the Web from their mobile device at least once a month.¹¹
- **Mobile broadband.** There are some 25 million subscribers today to laptop-based mobile broadband services. Again, this is a market segment rife with innovation, such as:

⁹ FCC Thirteenth Report on Wireless Competition, p.91.

¹⁰ Thirteenth Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Federal Communications Commission, January 2009. The number of messages per month in that report was 48 billion, which we assume has grown since (it grew from 18 billion to 48 billion per month in 2008).

¹¹ As reported in *Fierce Wireless*, September 17, 2009.

- **Form factor of PC cards.** Now popular are USB dongles, which are smaller, more reliable, and consume less power than PC cards. Developed by North American companies such as Sierra Wireless and Novatel.
- **Network speed.** Initial mobile broadband services used 2.5G networks such as EDGE and CDMA 1x, at speeds of up to 56 Kbps. Today, speeds of 400-700 Kbps are more common on UMTS and EVDO networks. Recent enhancements, such as HSPA+ are resulting in speeds of well over 2 Mbps, with more on the way from 4G networks using the LTE and WiMax standards. The move from under 100 Kbps to more than 5 Mbps for mobile broadband is happening in less than five years.
- **Innovative devices.** A growing number of laptops are now being shipped with embedded global wireless cards, such as Qualcomm's new Gobi chip. A new raft of devices with embedded wireless cards, such as netbooks and tablet PCs, are just now coming to market.
- **Applications.** Of course, we are all aware of the success of the Apple App Store. Today, there are more than 65,000 applications available on the App Store. More than 2 billion apps have been downloaded in the two years since the App Store's launch. Several other companies – from device OEMs to operators to third party companies – have or are planning to launch their own application stores. The app store phenomenon has led to the creation of an entirely new ecosystem – development, testing, marketing – and a multiplicity of business models whereby numerous entities are sharing in the revenue being generated by application downloads.

With regard to mobile applications and “app stores”, we have moved to a new and very different framework from a market structure perspective. There is a very low barrier to entry to getting onto a mobile device. Developers simply download a software development kit (SDK) in order to develop for one of the operating systems (Apple, Web OS, Java, etc.) and as long as they adhere to a basic set of rules and regulations (such as appropriateness of content, demand on the network), their app is up and running on the device. Typically, developers receive 70% of the revenues from applications sold. With this structure, all sorts of businesses are making money in mobile applications, from major media companies to small, “two guys in a garage” type shops.

II. U.S. Market Structure Fosters Innovation

A key question is whether the U.S. wireless market is structured so as to foster innovation. I would argue that the U.S. market is unique in the world when it comes to innovation.

Part of this success is attributed to the FCC's laissez faire approach to the U.S. wireless market. This has allowed the market to determine the optimal service provider structure, business models, air interfaces, and technology development. This, I believe, has fostered innovation. As an example, in Europe ETSI determined in the early 1990s that GSM would be the sole air interface standard. In the United States, the FCC did not play a role in determining what air interface we should use. Although we also have the GSM air

interface in the U.S., our structure also enabled Qualcomm to develop, and successfully market, CDMA technology, which was adopted by several leading U.S. wireless operators, as well as others all over the world. The development of CDMA and the growth of Qualcomm spawned a cluster of wireless-related companies in the greater San Diego area, plus many other companies related to the development of spread spectrum technology. CDMA-based technologies have proven critical to the development of successive generations of wireless networks along both the 3GPP (a.k.a. “GSM”, or WCDMA) track for UMTS, and 3GPP2 (a.k.a. CDMA2000) track for EV-DO, and form the basis for the 4G standard called LTE, which is being adopted by most major operators worldwide. The WIMAX standard, which is also being used for 4G, was developed primarily by U.S. firms.

The free market structure also enabled Motorola’s development of iDEN, the market-leading technology for push-to-talk. Sprint Nextel has long had the world’s largest iDEN network, and the technology has proven critical for certain vertical business segments such as construction and public safety and has been widely deployed in the government sector.

The “multi-standard” U.S. wireless market – CDMA, GSM, iDEN – ultimately required the development of “multi-mode” devices to accommodate multiple air interfaces, which has required new and innovative research in radio technology.

I would also argue that the U.S. market structure is enabling innovative wireless service business models. With the exception of the initial cellular license grants at 850 MHz in the early 1980s, market forces have been the principal determinant of who offers wireless service. With no national wireless licenses and a series of wireless spectrum auctions over the past fifteen years, there have been numerous opportunities for new entrants into the market. Even with all of the consolidation activity over the years – and it has been shown, not only in the U.S. but most other geographies – that scale is critical to competing effectively as a mobile operator – we are in a period of intense service provider competition and business model innovation. Today, the average U.S. consumer can choose from six or more wireless providers in nearly every major city. There are numerous options for post-pay, pre-pay, and hybrid, “pay in advance” services. The market has also been innovative with respect to offering consumers a choice of ways to pay for their wireless service. If they want a “subsidized” device, they can commit to a one or two year contract. Or they can choose a pre-paid or advance pay service. Subscribers can also receive the benefits of “contract” rates but pay month-to-month, if they pay full retail price for the device.

We have also seen the emergence of a vibrant market for MVNOs and other service providers with innovative business models. Three years ago, when ESPN, Disney, and several other high-profile MVNOs failed, that market opportunity was declared all but dead. But the MVNO market today is alive and well. Virgin Mobile, TracFone, Boost, and OnStar are all examples of successful MVNOs. They are successful for two main reasons: first, MVNOs have become smarter about market segmentation, so Boost can focus on a service for the youth market and Jitterbug can offer a service focused on the

needs of the mature market, for example. Also, significant increases in network capacity, enabled by a combination of improved technology and additional spectrum availability, have allowed facilities-based wireless operators to develop a more viable wholesale business.

Our current market structure is allowing for the continued development of innovative business models. The Amazon Kindle is an example – where the price of the service is bundled in with the cost of the content. Just this past year we have seen a plethora of innovative devices leveraging ever-more capable wireless networks: from photo frames with embedded wireless chips to the first wave of wirelessly enabled netbook devices. The huge capital investments being made in 4G are predicated on “300-400 % device penetration”, to paraphrase the words of Verizon Wireless CEO Lowell McAdam. This will mean a huge variety of devices for all sorts of purposes. We will see purpose-built or application-specific devices for particular verticals, such as high-end wirelessly enabled cameras for the insurance industry to specialized devices for a more modernized health care system. This will also lead to the development of new and unique business models for these devices and services, such as we are already seeing with, for example, Verizon’s Open Development Initiative.

Our open market structure is also encouraging innovation in the applications arena. Apple has the market-leading “app store” in the U.S. today, with 65,000 apps and 2 billion downloads in just over one year since launch. It is true that the iPhone is exclusive to AT&T at this point. But let’s put this in perspective. First, the App Store can be used for all iTunes users – Mac or PC – and can also be used on the iPod Touch, which does not require an operator relationship and has sold more than 20 million. Second, the “dominance” of the Apple App Store has more to do with the iTunes distribution mechanism. iTunes software is nearly the defacto standard for both Macs and PCs, and the App Store was added in a way that music, podcasts, TV shows and movies had been previously. Even so, the market is open to alternatives. Some app stores are centric to a device, such as Blackberry App World, for Blackberries or Ovi for Nokia devices. Others are more centric to an operating system, such as for Android (Google), Windows (Microsoft), WebOS (Palm), and Linux (Limo Foundation) devices. Then there are third-party companies, such as Handango, Handmark, GetJar, and Motricity, that host third party store-fronts, either white-labeled for a device or operator’s apps offerings, or for apps that be purchased across a broad array of devices. For example, GetJar, based in Europe, has sold more than 300 million applications, averaging 14 million downloads per month.¹²

The burgeoning mobile applications market is creating its own multiplier effect. Tens of thousands of developers have downloaded SDKs for developing applications for the different operating systems. Third-party development houses, such as Apperian, have set up shop to develop mobile applications, just as we saw in the gaming business, Kleiner Perkins, a top-tier venture capital firm, created a \$100 million fund for iPhone apps, and

¹² GetJar corporate Web site, www.getjar.com.

the Blackberry Partners Fund was founded about two years ago to invest in wireless opportunities.

The mobile applications market is leading to a more open structure and a myriad of business models. We are actually in an “experimentation” stage with regard to application pricing. Some apps are free, while others can be downloaded at prices starting at \$0.99. Some apps have a “free” or “premium” option. Others require a subscription. And some are free but rely on advertising for revenues. This is playing out like the digital content business for movies and TV shows. For example, TV shows can be viewed on Hulu or networks’ websites, but often require the viewer to watch ads. Or, viewers who don’t want to see ads can buy or rent the program from iTunes.

Capital

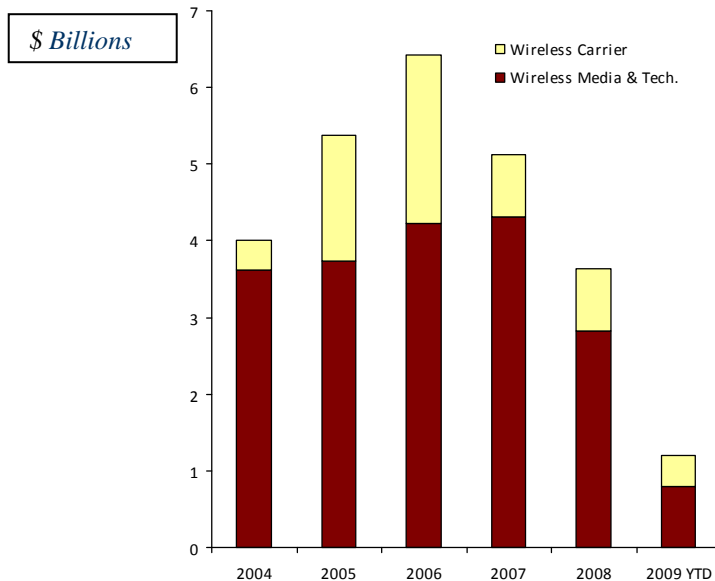
Another barometer of innovation is the level of capital invested in the wireless industry. Wireless operators continue to invest substantial sums in improving their networks. Network capex is allocated to improve network coverage, add capacity, and roll out new technology, such as 3G. According to CTIA, wireless capital expenditures totaled \$217 billion from 1998-2008 (not including the cost of spectrum), which went toward improving infrastructure, including cell towers and R&D. Wireless carriers reported an average combined investment of \$22.8 billion per year from 2001-2008 to upgrade their networks. Network capex consistently comprises some 15-20% of operator revenues. Wireless operators have also spent, collectively, nearly \$50 billion in spectrum auctions since 1995, including the nearly \$20 billion for 700 MHz spectrum in the most recent auction. If wireless spectrum purchases and capex are added together, we’re probably in the neighborhood of a half-trillion dollars that has been pumped into the U.S. Treasury and the economy in the past 20+ years. And things are not slowing down – in 2008, the number of new cell sites deployed grew by more than 13%.¹³ And we are just starting the next major network investment cycle, as 4G networks are deployed by the major operators over the next 3-4 years. This commitment – which is well ahead of what has been announced in most other countries – is a good barometer of confidence for the industry’s innovation and growth prospects.

Huge amounts of money have also been invested in start-up companies in the U.S. wireless industry. As the graph below shows, venture capital firms have invested nearly \$30 billion in wireless companies just since 2004. The data also shows that this capital is being spread across numerous “sectors” of wireless, from carrier infrastructure to consumer applications. Venture investing in the wireless industry in the U.S. far outweighs what we see in other geographies. And this investing is not limited to Silicon Valley. Significant mobile “clusters”, which consist of both capital and new company energy, exist in northern and southern California, greater Boston, Seattle, San Diego, and the Dallas area.

¹³ CTIA, Semi-Annual Industry Survey.

Exhibit 4: Venture Capital Invested in U.S. Wireless Companies

Source: Rutberg & Co.



III. U.S. Compares Favorably to Other Geographies

In assessing whether the current market structure encourages innovation, it is important to look at the U.S. market compared to other advanced economies. There has been a long-held perception that the United States trails other countries in wireless development and innovation. That perception is a myth. Let's look at this across a number of categories.

- **Wireless pricing.** Retail voice pricing in the United States is about the lowest in the developed world, at about \$0.05 per minute. This is dramatically lower than in many other “developed” wireless economies. High voice pricing in Europe is one reason why voice usage is significantly lower (less than 200 minutes per month for a typical subscriber, compared to 800 in the U.S.). And for a time, text messaging adoption and usage in Europe were ahead of the U.S., in part because they substituted for voice usage and because PC and IM penetration was not as high.
- **Wireless competition.** The average U.S. consumer has a choice of at least four nationwide wireless operators – and several more if newer carriers such as Leap, Metro, and others are considered. Additionally, there is a growing number of MVNOs whose service is available on a near-nationwide basis. The largest ones include Virgin Mobile, Boost Mobile, and TracFone. This compares favorably with the most competitive wireless markets in Europe and Asia.
- **Wireless networks.** The U.S. has rapidly become a world leader in advanced wireless network deployment. Today, we have three, and closing in on four,

nationwide 3G networks in operation. Other facilities-based operators, such as Metro PCS and Leap, are deploying 3G networks as well. Very few other countries can boast both the number and ubiquity of 3G networks. This is clearly reflected in the growth and evolution of data usage. As has been noted elsewhere in this Paper, wireless data revenues have been growing at better than 50% annually for several years running, and now comprise nearly 30% of revenue at some operators – a huge number. And the source of those data revenues has been diversifying away from just text messaging and ringtones to include mobile e-mail, browsing, applications, multimedia, and broadband use from laptop cards. The U.S. has become a world leader in data revenues per subscriber, and in the diversity of sources of that data revenue (i.e. not just text messaging).

The leadership position in networks is poised to continue. An enhancement to 3G, called HSPA Plus, is being deployed by AT&T, T-Mobile, and other operators here. This allows peak data rates of up to 21 Mbps. Again, the U.S. is a leader in deployment of HSPA+.

We will also be pioneers with respect to 4G. Already, Clearwire has the world's most widely deployed WiMax network, with plans to add many more cities in 2010. Verizon Wireless completed one of the world's first test calls on LTE, and plans to begin broad commercial deployment in 2010, with national coverage planned for 2013. Again, few other operators outside the U.S. have committed to 4G in as significant a way as Clearwire and Verizon have done.

- **Wireless devices.** We have a much more diverse and distributed handset market in the United States. Nokia, which has 40% market share worldwide, has less than 10% share of the U.S. market. No particular handset OEM has dominant share of the market here.

Even more importantly, the U.S. is the locus of handset innovation. Some of the most advanced and popular mobile devices were designed and first sold here, dating back to the Motorola StarTac and RAZR.

Most of the new platforms for smartphones have been developed in the United States:

- **Apple iPhone** – “made by Apple in California” comes in every box
- **Android** operating system and the first handset using that OS, the G1. Several device OEMs and most operators have committed to developing and launching devices based on Android. Android was a start-up company that, early in its development, was acquired by Google.
- **The Sidekick 1 and Sidekick 2**, developed by a start-up company called Danger Research (acquired by Microsoft in 2008). Incidentally, one of the founders of Android was a founder of Danger.
- **Palm devices.** Starting with the Treo back in 2004, and more recently the Palm Pre and Palm Pixie.

- **Windows Mobile.** Devices based on the Windows OS have held steady share, and are sold by OEMs such as HTC and Samsung.
- **Blackberry.** The U.S. has consistently been and continues to be the largest market for Blackberry. Blackberry has, by far, the leading share in the enterprise market and has been heavily deployed by federal, state, and local governments. Research in Motion, which makes the Blackberry, is based in Canada.

In addition to being a locus point for smartphone development, the innovative culture enabled by the U.S. market structure, level of competitiveness, and availability of capital is resulting in our being a center for hardware and software innovation as well. “Thin” form factor innovations have been led by Motorola (RAZR, “Q”), touch screens for phones by Apple and Palm, and other handset user design innovations, such as the accelerometer (Apple) and device-based voice recognition (Nuance, based in Boston). Our vibrant software industry has helped create and enable major advances in user experience design, again pioneered by companies such as Palm and Apple. One of the world’s leading UI design firms, IDEO, is, naturally, located in California.

Applications

With ever more capable mobile devices, applications, including new ways and unique uses of the mobile device, are among the fastest growing sectors of the wireless industry today. Again, the U.S. market is in a leadership position here. The success of the Apple Application Store has been a huge and defining element of the evolution of the mobile experience in the barely over a year since its launch. Even though it was not the first “app store”, it has rapidly become the leader across many criteria, including the user experience. Its success has, naturally, spawned the development of many other “app stores”, sponsored by a variety of players across the wireless ecosystem: other device OEMs (Nokia, Samsung, Palm); software companies (Google, Microsoft); operators (T-Mobile, Verizon Wireless); and others (Handango, GetJar).

Most importantly, the emergence of mobile applications, after years of talking about it, is generating a new wave of excitement about, and investment in, the mobile sector. With ever more capable devices and networks, we are at the point where the mobile phone can be a multi-purpose device – sort of like a small computer – but in some ways capable of even more (given its “always on, always with you” characteristics and GPS capability). Ironically, we are at a point in the development of the wireless industry where we probably know less about the types of applications that will be developed for mobile devices than we ever have. With open operating systems (OSs) and browsers, the wireless industry is looking more and more like the PC/Internet space, which has a highly innovative but also distributed development ecosystem. The sorts of companies that are playing an important role in wireless today are far different and more numerous than they were only three years ago. Whereas we used to have huge debates about operator control, the “walled garden”, and so on, innovation in wireless is coming from a broad swath of companies in the PC/Internet (Apple, Google, Microsoft, Intel) and digital media/content

(developers, Facebook, Twitter, TV networks, music labels) ecosystems – not necessarily traditional “wireless” players.

Because this industry is going to support so many more types of devices, variety of applications, and significantly more functionality, we actually know less about the direction this market is going to take than we historically have. Clearly, we are at an early stage in defining next-generation business models – after all, mobile advertising is just starting to be a force, and we will have to come up with novel and more flexible ways for people to pay for data applications, and, conversely, creative mechanisms for monetizing them. The one thing we can probably say with great confidence is that the growth of the market is going to be in these non-traditional areas.

This all speaks to ensuring that we have a market structure in place that fosters innovation. There has been more development of new functionality and applications in mobile in the past five years than we saw in the first twenty. The major players in this development are different and more numerous today than they once were. Our market structure, given the world leadership we have in the PC/Internet space and sources of capital, has fostered this accelerated rate of innovation and has put the U.S. wireless market in a position of global leadership across many key criteria: pricing; 3G network coverage; data growth; advanced device development; mobile applications; and user interface design, among others. At the same time, with all this innovation, industry ARPU has remained flat – indicating that consumers are getting increasing value from their mobile experience.

Conclusion

Given that wireless is one of the most important growth industries in the U.S. economy, it is the right time to be examining whether we are optimally structured to be a world leader in innovation. So far, our track record has been good, and I would argue that over the past five years we have pulled ahead across a broad number of criteria.

The U.S. wireless market is among the most competitive, accessible, and affordable in the world. We lead in the deployment of advanced networks, and in the development of smartphone devices, operating systems, and innovative form factors. Data service adoption and revenues lead in just about every major category with a vibrant and competitive applications market taking us onto a completely new trajectory. We are poised to extend that leadership with the deployment of 4G, which is being built around a principle of open development, and an abundance of new types of connected wireless devices. Not only is the U.S. market a vibrant laboratory for new service concepts and business models, but also a disproportionate level of innovation, across many aspects of the mobile ecosystem, is originating here and being exported to the rest of the world. In short, the current market structure and regulatory framework for wireless is working well, and, if it remains in place, will ensure that the U.S. continues this leadership role.



Mark Lowenstein Biography



Mark Lowenstein is a prominent wireless industry executive, consultant, analyst, and commentator. As Managing Director of Mobile Ecosystem, Lowenstein advises C-level executives on corporate, product, market, and industry strategy across the value chain of the wireless, communications, and digital media industries. Clients include wireless carriers, equipment suppliers, application and content developers, marketing and advertising firms, corporate end-users, and key members of the investment and venture capital communities.

Most recently, Lowenstein was Vice President of Market Planning and Strategy at Verizon Wireless, where he led the company's efforts in market segmentation, business planning, national pricing, and market intelligence for the consumer and enterprise markets.

Lowenstein's consulting career began at the Yankee Group, where he founded and led the company's top-ranked global wireless practices. As Executive Vice President, he supervised a global team of analysts, authored dozens of influential reports, and headed large-scale strategy consulting projects. As a member of the Yankee Group's executive management committee, Lowenstein also oversaw the growth of the company's Canada, Latin America, and Asia-Pacific practices, and led early stage electronic content and commerce initiatives.

As one of the wireless industry's senior thought leaders, Lowenstein is a frequent keynote speaker at corporate and industry events worldwide and is broadly quoted in the print and broadcast media. Lowenstein writes a monthly opinion column for *Fierce Wireless*, the leading on-line publication for the wireless industry, and his *Lens on Wireless* newsletter is read monthly by more than 12,000 industry executives and enterprise decision makers. Lowenstein also wrote a regular opinion column for *Wireless Week* for five years. Mr. Lowenstein has provided testimony to the FCC and has been retained as an expert witness in several cases pertaining to the wireless industry.

Lowenstein has served on numerous advisory boards over the course of his career, has been an adjunct professor at Tufts University, and has been selected as a judge in numerous business plan competitions. He founded and leads the Boston Wireless Braintrust, a group of the 20 senior-most executives and thought leaders related to the wireless industry in New England.

Mr. Lowenstein holds a B.A. from Tufts University and an M.A. in International Communications and Technology Policy from the Fletcher School of Law and Diplomacy. He lives with his wife and two children in Brookline, MA.